# THE CRUSHED STONE JOURNAL

*Official Publication*
The National Crushed Stone Association

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**Keeping Ahead of the Times in Paving Practice**

**Penetration Macadam, Design and Construction**

**Trade Association Movement Advances Cooperative Action**


**AUGUST, 1930**

# WHY HAVE LOSSES

## Poor Grading—High Overhead—Troubles

### Ask the following stone producers why they are using NIAGARA ROLLER BEARING SCREENS year after year

| | |
|---|---|
| Solvay Process Company | Jamesville, N. Y. |
| Solvay Process Company | Syracuse, N. Y. |
| Rock-Cut Stone Company | Auburn, N. Y. |
| Rock-Cut Stone Company | Ballina, Malison Co., N. Y. |
| Rock-Cut Stone Company | Jamesville, N. Y. |
| Rock-Cut Stone Company | Lacona, N. Y. |
| Rock-Cut Stone Company | Watertown, N. Y. |
| Mohawk Limestone Products Company | Mohawk, N. Y. |
| Mohawk Limestone Products Company | Jordanville, N. Y. |
| Mohawk Limestone Products Company | Mount Vision, N. Y. |
| BUFFALO Crushed Stone Company | Buffalo, N. Y. |
| Federal Crushed Stone Company | Cheektowaga, N. Y. |
| Genesee Stone Products Company | Stafford, N. Y. |
| LeRoy Lime and Crushed Stone Company | LeRoy, N. Y. |
| Ribstone Concrete Products | LeRoy, N. Y. |
| Dolomite Products Company | Rochester, N. Y. |
| General Crushed Stone Company | Oaks Corners, N. Y. |
| General Crushed Stone Company | North LeRoy, N. Y. |
| General Crushed Stone Company | Glenmills, Penna. |
| Wagner Quarries | Sandusky, Ohio |
| Wagner Quarries | Castalia, Ohio |
| Dolomite, Inc. | Maple Grove, Ohio |
| Hersog and Sons | Firest, Ohio |
| Ohio Blue Limestone | Marion, Ohio |
| National Lime & Stone Co. | Spore, Ohio |
| National Lime & Stone Co. | Carey, Ohio |
| National Lime & Stone Co. | Lewisburg, Ohio |
| National Lime & Stone Co. | Bluffton, Ohio |
| Belle Center Stone Co. | Belle Center, Ohio |
| Higgins Stone Company | Bellevue, Ohio |
| Lake Erie Limestone Company | Youngstown, Ohio |
| Lake Erie Limestone Company | Lowellville, Ohio |
| Lake Erie Limestone Company | Hillsville, Pa. |
| Lima Stone Company | Lima, Ohio |
| Spencer Stone Company | Spencerville, Ohio |
| Union Limestone Company | Youngstown, Ohio |
| Ohio Marble Company | Piqua, Ohio |
| C. C. Beam | Melvin, Ohio |
| Rock Products Company | Toledo, Ohio |
| France Stone Company | Holland, Ohio |
| France Stone Company | Monroe, Mich. |
| Swint Stone Company | Fremont, Ohio |
| J. E. Baker Company | Bainbridge, Lancaster Co., P. |
| J. E. Baker Company | White Hall, Baltimore, Md. |
| New Castle Lime & Stone Company | New Castle, Pa. |
| New Castle Lime & Stone Company | Dunbar, Pa. |
| Lehigh Stone Company | Ormrod, Pa. |
| Stowe Trap Rock Company | Pottstown, Pa. |
| Carbon Limestone Company | Hillsville, Pa. |
| Blue Stone Kuarry Company | Gwynedd Valley, Pa. |
| Whiterock Quarries | Pelasant Gap, Pa. |
| Connecticut Quarries Company | Rocky Hill, Conn. |
| New Haven Trap Rock Company | New Haven, Conn. |
| Edward Balf Company | Hartford, Conn. |
| John S. Lant and Son | Westfield, Mass. |
| West Roxbury Trap Rock Company | West Roxbury, Mass. |
| Old Colony Crushed Stone Company | Quincy, Mass. |
| Rowe Contracting Company | Malden, Mass. |
| Simbrico Stone ompany | West Roxbury, Mass. |
| Casper Stolle Quarry & Construction Co. | East St. Louis, Ill. |
| Consumers Company | Lemont, Ill. |
| Federal Stone Company | LaGrange, Ill. |
| Michigan Limestone & Chemical Company | Rogers City, Michigan |
| Biesanz Stone Company | Winona, Minn. |
| Meshberger Bros. Stone Company | Berne, Ind. |
| Hy-Rock Products Company | Marengo, Ind. |
| Fanwood Stone Crushing & Quarry Co. | Fanwood, N. J. |
| Samuel Braen | Patterson, N. J. |
| Orange Quarry Company | West Orange, N. J. |
| Granite Rock Company | Logan, Calif. |
| Daniel Contracting Company | San Francisco, Calif. |
| Deitz Hill Development Company | Kansas City, Mo. |
| Rock Hill Quarries Company | St. Louis, Mo. |
| Texas Trap Rock Company | San Antonio, Texas |
| Dittlinger Lime Company | New Braunfels, Texas |
| James Stone Company | Corsicana, Texas |
| Franklin Limestone Company | Nashville, Tenn. |
| Gager Lime Company | Sherwood, Tenn. |
| John H. Wilson | Honolulu, Hawaii |

CANADA

| | |
|---|---|
| J. A. Bourbonnais | Vaudreil, Que. |
| Canada Crushed Stone Corp. | Puslinch, Ont. |
| Coast Quarries | Vancouver, B. C. |
| Dufferin Construction Company | Innerkip, Ont. |
| Gordon Crushed Stone Company | Hagersville, Ont. |
| Thomas Langton Crushed Stone | Collwater, Ont. |
| LaCle A. Desrosiers, Ltd. | Montreal, Que. |
| Puslinch Quarries, Ltd. | Puslinch, Ont. |
| Quinn Stone and Ore Company | Ft. William, Ont. |
| Rigand Granite Products Company | Rigand, Que. |
| Stone and Son | Ingersoll, Ont. |
| Standard Lime Company, Ltd. | Joliette, Que. |
| Walker Bros. | Thorold, Ont. |
| Warden King Company, Ltd. | Montreal, Que. |

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☐ **HERCOMITES 2 to 7**—General purpose explosives • very economical where suitable • 240 cartridges* for No. 2, to 350 for No. 7 • also Hercomite Bag packed in 12½ lb. bags.

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D-2

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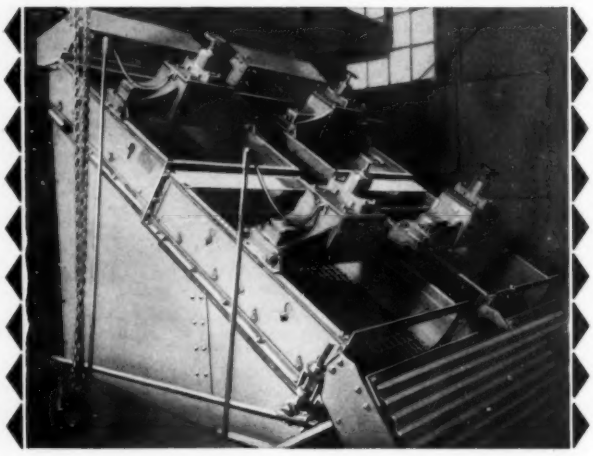

WHEN a customer puts a sample of your stone alongside of a competitor's—

Will there be a noticeable difference in your favor?

Will your stone show a greater uniformity with less oversize and fewer fines?

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# Means Established for Assisting Industry to Conform to Trade Practice Rules


By OTHO M. GRAVES,

*Chairman, Interpretation Committee—Trade Practice Rules*


AT the Trade Practice Conference for the Crushed Stone Industry, duly called and held by the Federal Trade Commission at the Hotel Gibson, Cincinnati, Ohio, January 23, 1930, the last of the resolutions adopted is to the following effect:

13. Resolved: That the Crushed Stone Industry, assembled in Trade Practice Conference, with Judge McCulloch of the Federal Trade Commission presiding, and with Mr. McCorkle of the Commission present, on January 23, 1930, authorizes the National Crushed Stone Association to take such steps as may be necessary to appoint a Committee on Trade Practices to investigate and determine whether these resolutions are being observed, to make complaints concerning alleged violations, to cooperate with the Federal Trade Commission, and generally to perform such other acts as may be reasonably necessary and proper to put these resolutions into effect and to accomplish the objects and purposes of this Conference.

In April the resolutions, with certain minor modifications were approved by the Commission as to Group I resolutions and the Group II resolutions accepted as an expression of thought from the Industry.

The following motion was duly made and carried at the annual meeting of the Board of Directors held at the Ambassador Hotel, Atlantic City, July 25, 1930:

I move you, Mr. President, that the Executive Committee be instructed to appoint a committee of nine, one member being chosen from each of the following regions:

| | | |
|---|---|---|
| New England | Southwest | Ohio |
| New York | South Atlantic | Illinois |
| Pennsylvania | Middle South | Missouri |

as an Interpretation Committee, and that power be vested in the chairman of that committee to enlarge the committee at his discretion as circumstances may indicate as wise, and also to vest in him the authority to eliminate any member of that committee when considering any complaint in which the interests of that member may in any way be allied so that he may be in any way biased; and further that this committee be required, before bringing any complaint before the Federal Trade Commission, to submit the evidence and its judgment to the Executive Committee, which shall have the power to review the same and decide whether the complaint should be submitted to the Federal Trade Commission.

The following is from the minutes of the Executive Committee meeting held on July 25th:

Acting under Rule D, Group II of the Trade Practice Conference Rules for the crushed stone industry approved by the Commission April 15, 1930, and in accordance with the instructions of the Board of Directors to the Executive Committee, it was moved, seconded and carried that an Interpretation Committee be appointed to consist of the following:

Otho M. Graves, Chairman, Pennsylvania
A. S. Lane, New England
James Savage, New York
(Appointment not yet made) Ohio
O. P. Chamberlain, Illinois
E. J. Krause, Missouri
E. Eikel, Southwest
T. I. Weston, South Atlantic
H. E. Rodes, Middle South

It will be observed that the Committee, whose creation was approved by the Federal Trade Commission and the personnel of which was selected by the Executive Committee acting under authority of the Board of Directors, was referred to as an Interpretation Committee. A more descriptive name perhaps would be "Interpretation Committee for Trade Practice Rules." The usual name among trade associations for such a committee is "Enforcement Committee." Our Board of Directors held the opinion, however, that the latter name suggested a threat of legal action which seems unnecessarily harsh and severe. It is

believed that the Industry in general sincerely intends to abide by these resolutions both in spirit and letter and that such infractions as may occur will be due more to a lack of understanding of the intent of the resolutions than to the intentional disregard of their meaning. The resolutions cover such simple and fundamental matters of business conduct and met with such unanimity of approval when adopted by the Industry at the Trade Practice Conference, that it appears that substantially all that will be necessary to cause general observance of the resolutions will be a complete and thorough understanding of their meaning and intent. Consequently to refer to the Committee as an Interpretation Committee seems to be more fitting and appropriate as well as less liable to create any misapprehension as to its functions and duties.

While it is true that Resolution 13 vests in the Committee the power of making complaints concerning alleged violations, it is generally believed that the Committee will seldom if ever find it necessary to lay before the Federal Trade Commission formal complaint of alleged violation of one of these resolutions. The Committee believes that most, if not all, of the complaints which may be presented can be amicably and equitably settled and friendly relations between competitors established by painstaking explanation, after digesting the evidence, to either the complainant or the defendant or both, as circumstances may indicate, analyzing the alleged violation and the meaning and intent of the resolutions which it is claimed have been violated.

It will be recalled that the Federal Trade Commission addressed a communication in April last to to each member of the Industry, affording therein an opportunity to formally subscribe to the resolutions. It should be borne in mind that the resolutions are binding upon every member of the Industry, whether or not such written approval was individually forwarded to the Commission. That this is so should be readily understood if it is realized that all of the resolutions were approved by the Industry at the Trade Practice Conference, that the Group I resolutions are statements of law to which we are all amenable, and that the Group II resolutions are merely expressions from the Industry, not legally enforcable.

It is hoped that the Industry will not only understand the manner in which the Interpretation Committee at present proposes to function, but also that any member of the Industry will feel entirely free to call upon the Committee for counsel and advice as to the meaning and intent of any one of the resolutions and lay before the Committee any instance of sufficient seriousness in which it is believed that anyone in the Industry is violating any one of these resolutions. Upon receiving such a complaint the Committee will ask the complainant, if he has not already submitted one, for a full and complete statement covering the alleged violation and will ask that this statement be sworn to before a notary public. The potential defendant will then be acquainted with the substance of the complaint and asked to submit to the Committee a complete answer also sworn to. If it appears that the defendant has actually violated one or more of the resolutions, he will be fully informed as to the opinion of the Committee and the basis for its conclusion and will be asked to assure the Committee that he will cease and desist from a continuance of the practice. Receiving such assurance, the evidence will be closed until such time as the case might be reopened by a further complaint, alleging that the defendant had not actually ceased and desisted from the practice concerning which complaint had been made.

If, however, the defendant were unwilling to assure the Interpretation Committee that he would cease and desist from a continuance of the practice which in the judgment of the Committee violated one or more of the resolutions, and all peaceful means had failed to secure a full subscribance to the resolutions involved, the Committee would feel it incumbent to submit the evidence and its conclusions, together with the refusal of the defendant to cease and desist, to the Executive Committee of the National Association, asking for its approval for the Interpretation Committee to file a formal complaint with the Federal Trade Commission. The Committee believes that seldom, if ever, will such an eventuality actually occur.

It is also entirely possible that the complainant is himself mistaken as to the actuality of the violation of one or more of the resolutions and that the answer by the defendant to the complainant would be satisfactory and convincing to the Committee, in which event an effort would be made to convince the complainant that no violation had actually occurred.

While it is probable that most of the work of the Committee can be conducted by correspondence, occasions may arise where the circumstances are of sufficient importance as to warrant and require one or more members of the Committee personally meeting with the complainant and defendant, either to more fully understand and absorb the evidence presented,

or to make entirely clear the findings and conclusions of the Committee and the reasons leading thereto. When such cases arise the chairman may or may not be present, but certainly the member in that section of the country in which the complaint arises, would be asked to act in person.

In this connection it is to be observed that the Committee has the power to enlarge itself as circumstances may require so that the chairman might appoint two temporary members to sit with the local member in such proceedings. It should be observed that no member of the Committee will participate in its deliberations if he be in any way concerned with the complaint or the defense thereto, nor would any local member be asked to serve temporarily who might in any way have a prejudiced self-interest.

It would be most unfortunate if any mistaken idea of the function of the Committee should arise whereby it be held that the Committee so act as to police the Industry. The Interpretation Committee will act upon complaint only, and will then endeavor to permeate its investigation with a human, sympathetic understanding, as well as a technical knowledge of, and a broad experience with the problems which confront members of the Industry. It is not to be expected that the Interpretation Committee will take the initiative, but it will vigorously respond when its advice, counsel or judgment is sought or requested.

We should be constantly mindful that through the Trade Practice Conference and the adoption of the resolutions by the Industry with their subsequent approval and acceptance by the Commission, we are afforded an opportunity of self regulation within the Industry without governmental interference. We should be able to thoroughly understand and abide by the resolutions which cover fundamental business practices and where differences of opinion arise, the Interpretation Committee should be able to satisfactorily adjust and harmonize conflicting opinions and by friendly means prevent a continuance of any actual violations of any one or more of the resolutions.

The Interpretation Committee is composed of members of our own Industry who understand our problems, which do not differ materially in various sections of the country and can sift such evidence as may be presented with an intelligent understanding of difficulties, to a greater extent perhaps than would be possible by a body of men who knew little or nothing about the crushed stone industry. Essentially, the Interpretation Committee hopes to be able, in such cases as may arise, to educate rather than enforce; to persuade rather than police; and to convince by friendly explanation rather than by formal complaint.

If any member of the Industry desires explanation concerning any of the resolutions adopted, or if any member believes that a competitor is violating any of the resolutions, the proper procedure is to write fully and completely to the chairman of the Interpretation Committee.

It is hoped that the Industry will avail itself of the opportunity thus offered to purge our business of unethical practices conflicting with the resolutions adopted and which are herewith appended and that generous use may be made of the services of the Interpretation Committee either as to full explanation of the meaning and intent of any of the resolutions, or as to considering and acting upon complaints of alleged violations. The Committee will maintain contact with the Federal Trade Commission and will seek its cooperation in the securing of informal advice and counsel upon such points as the Committee may be in reasonable doubt. The Interpretation Committee hopes to be of real assistance to the Industry, but it can perform this service only as its aid and advice may be sought and to this end a sympathetic cooperation from the Industry is desired and it is confidently believed that it will be forthcoming.

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# Trade Practice Conference Rules

*for the*

## Crushed Stone Industry

*approved by the*

## Federal Trade Commission

**April 15, 1930**

GROUP I

Rule 1

The wilful interference by any person, firm, corporation or association, with any existing contract between a seller and a purchaser, in or about the production, manufacture, transportation, purchase or sale of any product handled by the industry, or the performance of any contractural duty or service connected therewith, such interference being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the patronage, property or business of another engaged in such industry, is an unfair trade practice.

Rule 2

The false marking or branding of products of the industry with the effect of misleading or deceiving purchasers with re-

spect to the quantity, quality, size, grade or substance of the materials purchased, is an unfair trade practice.

Rule 3

The sale or offering for sale of any product of the industry accompanied by misrepresentations calculated to deceive customers or prospective customers as to the quantity, quality, size, grade or substance of such product, is an unfair trade practice.

Rule 4

The secret prepayment of transportation charges and/or the secret payment or allowance of rebates, refunds, credits, or unearned discounts, whether in the form of money or otherwise, or secretly extending to certain purchasers special service or privileges not extended to all purchasers under like terms and conditions, with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice.

Rule 5

Any discrimination in price between purchasers of the same class, not including discrimination in price on account of the difference in grade, quality or quantity of the product sold, or which makes only due allowance for difference in cost of selling and transportation, or discrimination in price in the same or different communities made in good faith to meet competition, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, is an unfair trade practice.

Rule 6

The defamation of a competitor by words or acts imputing to him dishonorable conduct, inability to perform contracts, or questionable credit standing, or the false disparagement of the grade or quality of his materials, is an unfair trade practice.

Rule 7

The selling of goods below cost with the intent and with the effect of injuring a competitor and where the effect may be to substantially lessen competition or tend to create a monopoly or to unreasonably restrain trade, is an unfair trade practice.

Rule 8

The secret paying, or promising to pay, to an employee of a customer or prospective customer, without the knowledge of his employer, of a commission or consideration of any character for the purpose of inducing or compensating for a sale, is an unfair trade practice.

Rule 9

The enticement of employees from a competitor for the purpose of interfering with his business is an unfair trade practice.

GROUP II

Rule A

The offering or giving of commissions, prizes, premiums, gifts or excessive entertainment to any one in connection with the sale, purchase or use of any product distributed by manufacturers within this industry, or as an inducement thereto, is condemned by the industry.

Rule B

The practice of making sales on an f.o.b. factory basis on all shipments except within local delivery limits enables the purchaser to know the cost of the product, exclusive of freight charges, and is a commendable custom and recommended by the industry.

Rule C

The industry hereby records its approval of the practice of each individual independently publishing his prices and terms of sale to the purchasing trade. The publication of fictitious prices and terms of sale by a manufacturer for the purpose of misleading the trade and the public is condemned by the industry.

Rule D

The Crushed Stone Industry hereby authorizes the National Crushed Stone Association to take such steps as may be necessary to appoint a Committee on Trade Practices to investigate whether these resolutions are being observed, to make complaints concerning alleged violations, cooperate with the Federal Trade Commission and generally to perform such other acts as may be reasonably necessary and proper to put these resolutions into effect and to accomplish the objects and purposes of this Conference.

## Safety Congress to Meet in Pittsburgh

From September 29 to October 3 the Nineteenth Annual Safety Congress and Exposition will be in session in Pittsburgh, Pennsylvania. Of particular interest to the crushed stone producers will be the sessions of the Quarry Section which will be held on Thursday of that week. Beginning with a luncheon on Wednesday, a joint session of the Cement and Quarry Sections will be held.

Unusual effort has been made to provide for the Quarry Section a most interesting and valuable program.

The general round table discussion, having as its title "Saving Money Through Accident Prevention" should prove particularly valuable and will be led by Otho M. Graves, Vice-Pres. and Gen. Mgr., General Crushed Stone Co., Easton, Pa. and W. E. Hilliard, Gen. Mgr., New Haven Trap Rock Co., New Haven, Conn.

The outstanding feature of the joint session of the Quarry and Cement Sections on Wednesday afternoon will be the address by Dr. H. S. Hulbert of Chicago on "Mental Self-Discipline Aids in Handling Oneself and Others, Especially in Relation to Accident Prevention and Safety."

Every member of the Association should be represented at this meeting and we urgently suggest that if you have not already done so you make immediate plans to have someone in attendance.

# Keeping Ahead of the Times in Paving Practice[1]

THE city of Bethlehem, Pennsylvania, has been building concrete pavements exclusively since 1923. At the present time more than 200,000 sq. yds. of concrete pavements are serving traffic, of which total 60,000 sq. yds. were built in 1929 alone. Concrete was first used for paving in Bethlehem in 1921 and with one or two exceptions larger and larger yardages have been laid year by year.

The remarkable feature of the concrete pavements, however, is not their amount, but their generally good design and construction. This quality of design and workmanship is due primarily to continual effort on the part of the engineering department and contractors to take advantage of all betterments and to pioneer in methods of doing things.

## New Methods and Designs Are Tested

Designs have been bettered from year to year, and changes in construction practices have been adopted as they have been used elsewhere. In addition, no change is incorporated until its value is tested as far as possible. The watchword has been "Test everything, and when good adopt it!" This policy has resulted in testing aggregates, reinforcing, thickness, cross-section, amount of water and cement, finishing and curing.

The quality of the concrete pavements is insured first of all by making certain that the materials used are of high quality and that they are structurally sound and adapted to Bethlehem's design and construction practices.

Bethlehem does not use sand, but uses a crushed and washed limestone screening or chips as fine aggregate. This material was adopted, first, because of its considerably lower price, 75 cents as against $1.40 per ton f.o.b. cars, and second because it compared favorably with the most widely used testing sand, Ottawa sand. In addition to lowering the cost, the use of this material has resulted in increased compressive strengths in test cylinders and pavements.

## Thorough Investigation of Limestone Screenings

Before this material was adopted exhaustive tests were made of its strength, absorption and grading. The Department of Civil Engineering of Lehigh University ran a series of standard mortar briquette tests, comparing the crushed limestone with Bay sand, Kenville sand and Ottawa sand. The results were as follows on specimens seven days old:

MORTAR BRIQUETTE TEST

| Test No. | Strength in Lbs. Per Sq. In. Bay Sand | Kenville Sand | Ottawa Sand | Crushed Screenings |
|---|---|---|---|---|
| 1 | 375 | 323 | 262 | 438 |
| 2 | 344 | 271 | 306 | 382 |
| 3 | 386 | 288 | 269 | 443 |
| 4 | 354 | 294 | 284 | 450 |
| 5 | 326 | 342 | 282 | 507 |
| 6 | 371 | 324 | 263 | 491 |
| Average | 360 | 310 | 280 | 450 |

The fine aggregate was further tested by comparing it to Ottawa sand and a fine grade local sand known as Succasunna sand in a series of tensile and 2 by 4-in. cylinder compressive tests. The tensile tests are the averages of the results of six specimens, while the compressive tests are the results of averages of five specimens. All specimens were seven days old when tested. The results of this series were as follows:

| Tensile Test | Strength in Lbs. Per Sq. In. 1:3 Mix | 1:2 Mix |
|---|---|---|
| Ottawa Sand | 194 | 268 |
| Succasunna Sand | 184 | 212 |
| Limestone Screenings | 230 | 298 |

| Compressive Test on 2 by 4-in Cylinders | Strength in Lbs. Per Sq. In. 1:3 Mix | 1:2 Mix |
|---|---|---|
| Ottawa Sand | 875 | 1510 |
| Succasunna Sand | 710 | 1450 |
| Limestone Screenings | 1570 | 2200 |

The city engineers were not content to rest with 7-day strengths, but tested the same materials with the same mixes at the age of 28 days. These tests were made by the Fritz Engineering Laboratory, of Lehigh University. The 28-day tests were as follows:

| Spec. No. | Compressive Strengths, 28-Day Specimens, Lbs. Per Sq. In. Ottawa Sand 1:3 | 1:2 | Succasunna Sand 1:3 | 1:2 | Limestone Screenings 1:3 | 1:2 |
|---|---|---|---|---|---|---|
| 1 | 1620 | 4160 | 1220 | 2940 | 3840 | 5260 |
| 2 | 1120 | 3470 | 1770 | 2500 | 4120 | 4670 |
| 3 | 1640 | 4130 | 2220 | 2720 | 4120 | 4680 |
| 4 | 1490 | 4560 | 1460 | 3200 | 4070 | 5060 |
| 5 | 2240 | 4460 | 1570 | 2600 | 4440 | 5150 |
| Aver. | 1620 | 4155 | 1670 | 2790 | 4120 | 4965 |

[1] From August, 1930, Issue of *Concrete*.

Tensile Strengths, 28-Day Specimens, Lbs. Per Sq. In.

| Spec. No. | Ottawa Sand 1:3 | Ottawa Sand 1:2 | Succasunna Sand 1:3 | Succasunna Sand 1:2 | Limestone Screenings 1:3 | Limestone Screenings 1:2 |
|---|---|---|---|---|---|---|
| 1 | 297 | 425 | 214 | 317 | 554 | 609 |
| 2 | 270 | 476 | 268 | 339 | 552 | 612 |
| 3 | 354 | 430 | 230 | 429 | 604 | 545 |
| 4 | 300 | 444 | 235 | 397 | 556 | 609 |
| 5 | 297 | 488 | 280 | 411 | 587 | 544 |
| 6 | 311 | 441 | 270 | 407 | 582 | 594 |
| Aver. | 305 | 450 | 250 | 363 | 573 | 584 |

Some indications of the grading and fineness modulus of these screenings was desirable, since it was known that the use of this comparatively harsh and gritty material might easily affect finishing and labor costs. Several sieve analyses have been made from time to time, all analyses showing about the same thing and also demonstrating that the material runs quite uniformly in grading over a period of years.

A typical sieve analysis of the screenings follows:

SIEVE ANALYSIS OF AGGREGATES

Per Cent of Sample Coarser Than a Given Sieve

| Sieve Size | Size of Square Opening In. | Succasunna Sand No. 1 | Succasunna Sand No. 2 | Limestone Screenings No. 1 | Limestone Screenings No. 2 |
|---|---|---|---|---|---|
| 100-Mesh | 0.0058 | 96.3 | 95.8 | 95.7 | 95.8 |
| 48-Mesh | 0.0116 | 76.4 | 80.7 | 88.1 | 87.1 |
| 28-Mesh | 0.0232 | 37.6 | 38.1 | 77.0 | 75.3 |
| 14-Mesh | 0.0460 | 13.1 | 13.7 | 62.6 | 61.1 |
| 8-Mesh | 0.0930 | 0.2 | 0.2 | 35.7 | 34.6 |
| 4-Mesh | 0.1850 | 0.0 | 0.0 | 1.4 | 1.3 |
| ⅜-Mesh | 0.3710 | 0.0 | 0.0 | 0.0 | 0.0 |
| Fineness Modulus | | 2.23 | 2.28 | 3.60 | 3.55 |

| | Succasunna | Limestone Screenings |
|---|---|---|
| Per cent retained on 50-mesh sieve | 100 | 90 |
| Per cent passing ¼ in. sieve | 78 | 99 |

Because of the close control over the materials entering the mix, the engineers were careful to take into account any effect the aggregates might have on the water content. Had one of the usual sands been used, absorption might not have been investigated except casually; but with screenings, absorption was important. If the screenings proved unusually receptive to moisture, serious changes might occur during mixing, resulting in a lack of uniformity. So absorption tests are run from time to time. These tests are closely supervised and conducted under laboratory conditions.

The tests are made on blocks 8 by 3¾ by 2¼ in. in size. After casting, the blocks are cured for 24 hours in a damp closet and are then heated at room temperature until constant weight is reached. The blocks are then immersed in water and tested. By way of showing results, a series of tests of the limestone screenings and Succasunna sand is hereby given:

RESULTS OF ABSORPTION TESTS

| Period of Immersion | Limestone Screenings Weight in Grams | Limestone Screenings Gain | Succasunna Sand Weight in Grams | Succasunna Sand Gain |
|---|---|---|---|---|
| Dry weight | 2506 | --- | 2259 | --- |
| 24 hours | 2672 | 166 | 2437 | 178 |
| 48 hours | 2674 | 168 | 2440 | 181 |
| 72 hours | 2680 | 174 | 2444 | 185 |

Limestone screenings absorbed 174 grams, or 6.95 per cent, in 72 hours.

Succasunna sand absorbed 185 grams, or 8.20 per cent, in 72 hours.

This test, typical of the absorption tests, indicates that the absorption of the screenings is somewhat less than that of the local sand. From tests of this kind the engineering department made certain that the batches would be uniform in water content with consequent uniformity of mixed concrete.

## Design and Construction Practice

These researches into materials have been paralleled by advances in design and construction practices. At the same time thought is given street improvement, so that completed pavements adequately meet traffic requirements.

The slab now laid is uniformly 7 in. thick. A feature of the design is the use of thickened edges along car track areas, manholes, inlets and other street structures. The thickened edge is not used along curb and gutters or longitudinal joints, as the engineers feel their standard slab is heavy enough for these locations. At the end of concrete pavements, however, a thickened edge is used to give added strength against the wear found where traffic goes from one type of pavement to another.

The pavements are always divided longitudinally for traffic guidance and to make laying easier. Streets in multiples of 10 ft. are divided into 10-ft. slabs. The 36 and 40-ft. streets are divided into 10-ft. traffic lanes and 8-ft. parking lanes. The joint is marked by painting over the joint filler. All longitudinal joints are made with a deformed plate and dowels are spaced at 3-ft. intervals.

The transverse joints used in Bethlehem are unusual in several respects. Unlike the longitudinal joints, no dowels are used; but like the longitudinal joints, a deformed metal plate is incorporated. This metal plate also carries premolded filler pressed on it on the job. The metal plate has a triangular deformation.

The process of pressing the filler onto the plate was

(*Continued on page* 18)

# Penetration Macadam, Design and Construction[1]

By C. L. WOOLLEY,
*Construction Engineer, Rhode Island State Board of Public Roads*

BITUMINOUS, or so-called penetration macadam, was officially recognized as pavements in 1912 by the Association for Standardizing Paving Specifications. Their definition was "The bituminous macadam pavement consists of crushed stone and bituminous material incorporated together by penetration methods." Devised at a time when a rapidly increasing number of motor vehicles was ripping water-bound macadams out before the contractors could get the towns and cities to accept the work, these "penetration macadams" promised wonderful service for a few years.

Used as a cure for all highway ills, built on any kind of a subgrade and constructed with little or no finesse, "penetrations" lost "caste" after a few years of trial when they failed to give adequate service. Failures under the methods of construction then in vogue could be predicted in from two to three years.

## The Rhode Island Design

Realizing that penetration macadams gave excellent service during the summer and fall months and that the critical period was in the spring during which the combination of thaws and loads soon reduced poorly constructed roads to mixtures of stone and mud, a rational design was attempted which would give an all-weather pavement at reasonable cost.

To indicate how well that design has stood the test of years in Rhode Island I would call your attention not only to the roads built since that period but to the fact that that design has only been changed in detail and not in basic principle since its inception.

Briefly that design consisted of:

1. A stabilized sub-soil or sub-grade plus adequate drainage facilities.

2. A layer of crushed stone compacted and bound together with sand or crusher dust.

3. A layer of crushed stone penetrated and sealed with asphalt.

I do not believe a discussion of sub-soils and their treatment is properly a part of this paper. Enough to say that no flexible type will stand up on poor sub-soil in an improperly drained location. Our use of granular material (run of bank gravel) to stabilize sub-soils has been successful. It is, however, based on the "Rule of Experience" and is probably uneconomical, as we also go on the principle that it is better to be safe than sorry.

The real scope of this paper is to develop and discuss a rational design for penetration macadam which can be simply, speedily and economically constructed by the contractor and which will give 10 to 15 years of good riding service to the public.

Naturally designs can be made which will eliminate, in theory, the weaknesses of this flexible type, but the field methods necessary to put these designs into practice prove either so uneconomical or so retarding that they defeat their own purpose and are either evaded or cancelled in the field. Such designs would include the thickened edge, the grouting or penetrating of the outside 2 ft. of the base and various other plans of the same nature. If these operations could be done simply, speedily and accurately, thus incurring no delay to the contractor or state nor adding considerable amount to the cost, they would be justified. They do not, however, meet these requirements and for these reasons have not been adopted.

This leads us to a discussion of the design and construction of base courses, and top courses and to the composition and quantity of the bituminous material.

## The Base Course

The ordinary base course of a bituminous macadam is a layer of crushed stone from 1 in. to 5 in. in size and anywhere from 3½ in. to 7 in. thick, rolled and filled with either sand or crusher dust, all tightly compact and presenting an open mosaic surface on which to place the top stone. These main requirements, thickness, compactness, and open surface, are essential.

By "thickness" we lower the intensity of the wheel load pressure on the sub-grade; by "compactness" we develop high lateral restraint and obtain better distribution of the wheel loads over the sub-grade and by

[1] Reprinted from June, 1930, issue *Roads and Streets*.

"open surface" we not only aid the bond between top and bottom courses but we prevent loose sand from entering the voids of the top stone which would prevent complete penetration. The quality, size, and shape of the material used in constructing the base course must meet these basic requirements and no more. In Rhode Island our base course thickness is 5½ in. after rolling. We use either crushed stone or crushed and screened gravel between 1 in. and 4 in. in size. We use either crusher dust from 0 to 1 in. in size or sand passing a ½-in. screen for filler. Our stone quality requirements are: toughness 6, French coefficient of wear 6, and the gravel must show not more than 15 per cent of loss by the Rea abrasion test. These requirements may appear too lenient but an impressive list of pavemnets showing no signs of distortion or failure would seem to justify their use. The use of large size stone and crushed and rounded particles of gravel has not been difficult to handle in the field and we have had no difficulty in obtaining "compactness" by the ordinary methods of rolling and sanding. We believe the key to success in obtaining a compact base course is in the rolling of the stone or gravel before any filler is applied. This prevents the filling and choking of the voids and the resultant loose uncompacted pockets in the base. It is also essential to apply the filler in small doses and "sanding and rolling" should be considered one construction operation.

We believe further that the essential requirement of "compactness" can be better met by a crusher graded stone or gravel from 1 in. to 4 in. in size than by an arbitrary commercial mixture of 1½ in. and 2½ in. crushed stone. The voids of our larger sizes are successively filled by gradations of smaller sizes until we finally bind the mass with sand or dust. The so-called commercial stone on the other hand has 30 to 40 per cent voids approximately of the same size and it is with difficulty that "compactness" is gained when binding with sand passing a ½ or a ¼-in. screen.

If thorough "compactness" has been obtained the sweeping of either type of base is simple but essential. Horse-drawn brooms may in dry weather get off a large percentage of excess filler, but hand brooms will then be needed to get the edges. In wet weather it may be necessary to use hand brooms over the whole surface of the base. If a good bond between the top and bottom courses is to be obtained this operation of brooming must be done thoroughly.

## The Top Course

The old rule for the penetration course is that the thickness of the course, the top size of the stone and the quantity of the asphalt shall be the same. This rule would indicate the necessity of meeting the following basic requirements:

1st. That the course should be as thin as practicable to reduce overturning and shoving.

2nd. That the stone should be as large as practicable to provide an even distribution of large voids.

3rd. That the quantity of the bituminous matrix should neither underfill the voids and cause raveling nor overfill the voids and cause shoving.

What we often forget when applying this rule is that the thickness of the layer must in practice be slightly more than the top size of stone. Thus a 2½-in. course of 2½-in. stone becomes when rolled 3 in. thick, due to the physical difficulty of applying crushed stone but one stone deep. We also forget that this rule applies to stone in the finished pavement. In other words a 2½-in. stone at the crusher unless of extreme hardness may become through injudicious rolling a 2-in. stone plus a few ½-in. chips. Thus we may easily have a 3-in. layer of 2-in. stone uneven as to voids, and choked with chips before penetration. Should we, on the other hand underroll in order to reduce this breaking of the top stone, we then sacrifice the benefit of the natural mechanical bond, which is of great benefit in the elimination of "shoving." A further construction difficulty of this 3-in. layer of 2-in. stone is the absence of complete penetration. Where chips have formed and the stone broken down under rolling in such a way that small voids are present the bituminous material instead of penetrating becomes a seal coat covering uncoated loose stone. The large quantity used to penetrate a 2½-in. to 3-in. layer is then spread over a small area of no depth and a slippery fat spot results which may in extreme cases cause a hole when the uncoated top stone underneath is subjected to loads.

Therefore, the rational design of the top course to meet the construction requirements would seem to call for a large, extremely well graded, and extremely hard stone, laid in as thin a course as is practical. We, in Rhode Island, call for a 2½-in. layer of trap rock. This stone must be retained on a 1½-in. screen and pass a 2½-in. screen. It must be rolled before penetration to develop the mechanical bond between the stone. It must be clean and the voids must be open.

The removal of small spots of ashes, the re-screening of small areas of dirty top-stone, the condemning

of whole cars of commercial grade of trap sent through as top stone, the removal by hand of leaves, sticks and other debris may seem picayune but it is only by the enforcement of these requirements for hard, well graded, clean top stone with clean open voids that excellent riding and lasting bituminous macadam is built. Mr. G. H. Henderson's paper on the "Causes of Success and Failure of Bituminous Macadam," presented before the annual Asphalt Paving Conference in November of 1926, covers these points in detail.

## The Bituminous Materials

The basic requirements for the bituminous materials which penetrate and bind the top course into a finished road are few but essential. As stated before the quantity of material should neither underfill the voids causing "ravelling" nor overfill the voids causing "shoving." The material should be ductile in cold weather but should not melt and flow during hot weather. It should be a material which will retain these characteristics over a period of years.

In our climate where the range of air temperatures is from 0°F. to 100°F. and where the road surface temperatures range from 10°F. to 150°F. an asphalt having a ductility of at least 30 and a penetration limit of 85-100 seems to meet all of the above conditions. By applying this material at the rate of 1¾ gal. on the penetration course and using ¾ gal. on the seal coat we seem to have met the "quantity" requirements as no ravelling nor shoving has appeared in our bituminous macadams built in the last ten years. It is unfortunate that the bad results of using too much asphalt in the penetration course or of using asphalt of too high a penetration, do not appear for two or three years. Almost every penetration road which develops corrugations and waves under traffic has had so much bituminous material shot into the top course stone that this stone is floating in the material. The practical maximum limit on the quantity of asphaltic binder, when a hard, durable stone is used, seems to be 2 gal., measured cold. When a stone which has a tendency to chip under rolling is used, this quantity of asphaltic binder must be reduced.

The minimum practical limit is approximately 1.5 gal. measured cold. By using less than this the chances of having ravelled spots develop under traffic is increased.

## Estimating Quantity in Distributor

An interesting and important field problem in the application of asphalt binders is the estimating of the quantity in the distributor. Asphalt increases in volume when heated and does not flow freely until heated to about 225°F. Thus a distributor loaded at a refinery takes on a load at from 225 to 350 deg.

On the job the load must be heated to 350°F. or 375°F. to get good penetration. The quantity required in the road, however, has been figured at 60°F. or what is known as "cold." To add to the confusion some companies weigh the asphalt, thus eliminating the variation in volume, while other companies merely rate the volume of their tank trucks at 800, 950 or 1,000 gal. of material whether hot or cold.

That this expansion amounts to something both in money and material is evident when we realize that asphalt expands 10 per cent in being heated from 60°F. to 350°F. We have worked out the following rules for handling this problem:

1. We buy the asphalt by weight and are billed so many tons converted into "cold" gallons.
2. We pay the contractor who "heats, hauls, and applies" the material the same gallonage that we pay the producer.
3. On the job we convert the weight slip weight into cold gallons and figure our yardage of penetration by dividing by 1¾.
4. When no weight slip is received on the job we take the gallonage rating of the truck and figure our yardage or penetration by dividing by two.

In this way we compensate for the volume charge.

## Application of Key-Stone

Oftentimes the difference between a good penetration and a poor one shows during this operation of penetrating and applying of this choke stone. The scattering of this choke stone in such a way that it does not get onto the unpenetrated top stone; the brooming of this stone so that it does not bunch; the using of tar paper or troughs to prevent double laps and fat spots at the start of each distributor load; the leaving of an uncovered strip on half width penetration to prevent a double ridge of choke stone down the center; the cross lapping of penetration and seal coats to eliminate an unsightly center joint; all of these are some of the essential construction details that must be rigidly enforced in order to obtain a good job.

(*Continued on page* 22.)

# Trade Association Movement Advances Cooperative Action

By Earl W. Barnhart

*Chief of Commercial Education Service, Federal Board for Vocational Education*

AN outstanding characteristic of every line of industry and business in this country is the increasing tendency toward cooperative action, especially through participation in the activities of a commercial trade association of some kind or other.

The term commercial trade association is used to distinguish associations or organizations of business men primarily interested in selling and allied distributing functions from those associations or organizations primarily interested in manufacturing and allied producing functions.

Practically every business man of any importance, whether a manufacturer, retailer, banker or accountant, is a member of at least one kind of commercial trade association. Many firms are members of a dozen or more State, interstate, and national commercial trade associations each actively promoting and protecting some special interest of its members. While the very small retailers and manufacturers often are not members of any but the most aggressive local trade organizations, yet practically every one of the smaller units of the national distributive system is benefited by the activities of these associations which promote the welfare of all in a territory or a trade regardless of the size of the business or membership in the association. Indeed even the smallest merchants and manufacturers seem to realize the benefits which come from the work of the commercial trade organizations in their communities or lines of business whether it be a chamber of commerce, a credit bureau, a State association or a national body with its staff of experts and its monthly magazine and service bulletins.

The Directory of the Commercial and Industrial Organizations of the United States, recently issued by the Department of Commerce, names about 2,000 national and international, and interstate, about the same number of State, and about 9,100 local commercial and industrial organizations operating in this country in June, 1929, or a total of about 13,000. The classified list of these organizations is so extensive as to justify the belief that a trade organization has been created to promote the welfare of almost every kind of industry and business in this country and of practically all the most conspicuous commercial occupations of the professional type such as accountants, credit men, office managers, or purchasing agents.

These "trade associations represent a natural development of our commercial and economic life. Their extraordinary network extends through practically all branches of industry and trade. Most associations are national in scope; a few are international. There is no common pattern for their organization. Some are constituted horizontally, comprising certain stages of production or distribution; others are constituted vertically, their membership including representatives from every link in the chain from producer of raw materials to the ultimate retail distributor."

## Some Firms Members of Many Organizations

"Organizations of a technical nature, resembling trade associations in many respects and closely affiliated with them, introduce tangents and diagonals into the business organization charts. Certain firms may belong to as many as a dozen associations. A manufacturer of chemicals is probably interested in not less than five associations of manufacturers alone. The same is true of a manufacturer of hardware. Variety of function and geographical distribution of membership may create diversity where uniformity seems desirable. Sometimes there are two or more associations supplying identical services, divided because of some original difference of opinion or other peculiarity. . . ."

One major purpose of practically all commercial trade associations is to supply information valuable to the members of the organization. All hold conventions at which addresses on topics of general interest are made by speakers from outside of the business or by members and officers of the organization. In addition many commercial associations maintain service bureaus which issue bulletins, news letters, and summaries; while some organizations publish a magazine

or review or else have a special department in a trade journal published as a commercial enterprise. In other words, practically all commercial associations are largely educational in purpose in so far as the general distribution of trade information is educational.

In addition to these general methods for providing the trade or occupation with useful and interesting information, some associations have organized special agencies for the intensive study of particular trade problems with a view to getting the most accurate or comprehensive information possible on some matter of special interest or value to their members. Thus, many associations have permanent member committees on standards and practices, or have service bureaus in charge of salaried experts. Many maintain statistical bureaus for gathering data about sales, prices, production, and markets.

### Cooperative Relations with Research Agencies

Some commercial trade associations have developed cooperative relations with research agencies such as the United States Bureau of Standards, the Mellon Institute, and other public and private research agencies, including university laboratories. The university bureaus of business research such as those at Harvard, Ohio State, Northwestern, and Stanford universities, are used on a cooperative basis by commercial trade associations interested in obtaining reliable figures on the cost of doing business in their special fields.

A few associations have gone further and have established their own research departments, employing experts to direct the studies and activities of a staff of investigators, or of a research laboratory or a model plant. Some maintain a consulting service in charge of qualified specialists. Other associations support cooperative credit, transportation, or insurance departments for the benefit of their members. A few associations in the commercial field pay special attention to trade relations and have developed a code of ethics which the organization is trying to establish as the basis for certain trade practices and policies.

In countless ways, suited to the nature and resources of the particular association, many of the commercial trade bodies in this country are collecting through the most reliable and scientific methods and agencies, the information wanted by the members of the organization. This information is broadcast through convention speeches, committee reports, trade bulletins and magazine articles. In thus acting as a source of accurate information for the trade they represent, these associations are serving as educational agencies by making available information valuable to their members and the trade or occupation generally in the more efficient conduct of business.

## Winter-Laid 10,000 Lb. Concrete on Chicago Viaduct[1]

By Arthur R. Lord
*Consulting Engineer, Chicago*

THE city of Chicago is now building a new bascule bride across the Chicago River at Wabash Ave. Since the south abutment of this new bridge occupies a portion of the broad plaza of Wacker Drive at this street, a large area of the reinforced-concrete deck slab of the drive and several supporting columns had to be removed. During the demolition work chunks of concrete were taken from the debris and tests were made of sawed cubes representing both slab concrete above and paving base concrete. The results of the tests, given in the accompaning tabulation, show an average strength for the 3x3-in. cubes of 11,400 lb. per sq. in. Cylinder tests at 28 days showed a strength of 2,620 lb. per sq. in.

The concrete in this portion of Wacker Drive was placed on January 6 and 7, 1926, as a part of a placing operation that started on January 4 and continued without interruption, day and night, for 99 hours. The weather, favorable at the beginning, relapsed into severe cold later, but at the time this particular portion of the Drive was placed had moderated somewhat and turned into a snowstorm. Temperature in the air above the slab varied from zero to slightly below freezing. All materials were heated, to give temperatures in the fresh concrete of about 80 deg. F. at the mixer, about 60 deg. F. at the forms and about 35 to 40 deg. F. at the upper surface of the slab by the time it had

| | | Crushing Strength, Lb. Per Sq. In. | |
|---|---|---|---|
| Sample From | Test No. | 3x3-In. Cubes | Equiv. Cylinder (85 Per Cent Cube Strength) |
| Superstructure ------ | 1 | 10,200 | 8,700 |
| | 2 | 11,800 | 10,100 |
| | 3 | 12,700 | 10,800 |
| | 4 | 11,200 | 9,500 |
| | 5 | 11,200 | 9,500 |
| | Average | 11,400 | 9,700 |
| Paving base -------- | 6 | 10,200 | 8,700 |

[1] From August 14, 1930, issue of *Engineering News-Record*.

hardened sufficiently for workmen to cover it with straw. The air beneath the slab, heated by salamanders, varied from 55 to 85 deg. F. through the curing period of seven days. Under the hay, the surface of the slab showed comfortable temperatures for the entire week, well above the usual specification of 50 deg. F. minimum.

This concrete was made with the usual winter proportions—seven sacks of cement, 14 cu. ft. of Beloit sand (fineness modulus about 2.8) and 22 cu. ft. of crushed limestone (fineness modulus about 6.6). The water-cement ratio, allowing for the moisture in the aggregates, was about 6.5 gal. of water per sack of cement. The slump of the concrete at the forms showed an average of 2.9 in. for the two days, January 5 and 6.

Eighteen sets of 6x12-in. test cylinders (from eight to sixteen cylinders to a set) were taken on these two days. The average crushing strength of 7-day cylinders was 2,120 lb. per sq. in., of 28-day cylinders 2,620 lb. per sq. in. The small increase between the 7-day and 28-day period was due to the fact that heating was discontinued beneath the slab after seven days. Test cylinders were stored on plank platforms located in the formwork so as to have a temperature equal to the average between the top and bottom temperatures of the slab, as nearly as we could arrange it. If Slater's equation, $S_{28} = S_7 + 30\sqrt{S_7}$, be used to estimate the probable 28-day strength of this concrete under favorable curing conditions, we obtain a value of about 3,500 lb. per sq. in., instead of the actual test value of 2,620 lb.

This concrete was 46 months old at the time the cubes were tested. Cubes were damp at time of testing and were capped on both ends with a thin layer of plaster of paris in the usual manner. In the accompanying table a column of "equivalent cylinder strengths" appears, which is given for comparison with the usual cylindrical form of test specimen. This strength is taken as 85 per cent of the actual cube strength, the percentage being based on the average of numerous published comparisons of cube and cylinder tests of identical concrete. The strengths shown by test at 46 months are over three times those at 28 days, and over 2½ times those that would be expected at 28 days in summer weather for this mix and water-cement ratio. The paving base concrete was about a 1:9 mix placed with no slump and hand tamped.

## New York Will Widen Roads

THE widening by 1940 of all main roads in the State to widths more than 40 feet is planned by the Department of Public Works, which has just adopted an ultimate road-width map based upon a traffic survey made last August, according to the Superintendent of Public Works, Col. Frederick Stuart Greene.

The width of the roads on the map, Col. Greene explained, was determined by a census of the number of cars traveling over them during a 12-hour daylight period. Provision is made for pavements of more than 40 feet in width for the main trunk lines in Westchester County and on Long Island in the vicinity of New York City.

Lesser traveled roads around the metropolis and in the vicinity of other large cities are to be from 36 to 40 feet in width. Heavily traveled roads near the smaller cities are to be from 27 to 30 feet, and in the rural districts from 16 to 20 feet. Few State roads now are more than 30 feet in width, while a majority of the heavily traveled roads outside of the main trunk lines are 20 and 22 feet, and in the rural districts 16 feet is the prevailing width.

Col. Greene stated that he feels confident the Legislature will appropriate sufficient funds to carry out the plan in the next 10 years. He said that the recently enacted gasoline tax will make the money available and that the Legislature will have to meet the demands of the public for wider roads because of the increased congestion on highways whose widening and improvement in the last few years has been far less rapid than the growth of automobile traffic.

## Eyesight in Industry[1]

By Arthur C. Carruthers

THE term "eyesight" is very generic, elastic word. It may mean anything from perfect vision to almost blindness, therefore in considering the subject of eyesight from an industrial employer's viewpoint, we want to be a little more specific. The alert, progressive employer who seeks efficiency in his working force realizes that productive efficiency depends upon many different conditions and qualities and, among these falls the *condition* of the eyesight of each of his employees.

It is only necessary for one moment to contemplate the fact that we depend more on our eyesight than any other organ in pursuing industrial tasks, and the

[1] From the April, 1930, Issue of *Safety Engineering*.

better the condition of the eyesight—or in other words, the more efficiently the eyes can serve our needs, the more economically and profitably can be employed the hours of labor. It may be taken as a fairly correct maxim that the condition of a worker's eyesight, more than any other factor, determines how correctly he can perform not only his work but observe the rules and regulations which obtain in the plant.

Reliable statistics proclaim that not less than 50 per cent of all industrial workers suffer from defective vision in various stages. The results of eyesight examination surveys have disclosed in some cases even a higher percentage of defective vision or poor eyesight in a working force.

It is impossible for a layman to determine the condition of a person's eyesight by either looking at their eyes or watching them work. Efficiency in the human equation does not present itself in the same way as in a machine. Especially, is this so in tasks where precision and adeptness are required. A person may be most expert through years of continual practice in performing a certain operation—he may excel others in technique and knowledge of the subject, but at the same time, if at a vital moment when his eyesight is centered on the work, he only sees with a 50 per cent eye efficiency, his expertness, experience and knowledge may be sadly retarded in accomplishing the task perfectly on account of defective vision. This is but an instance which could be multiplied by hundreds, but a little thought on the subject will readily suggest the impossibility of a person delivering 100 per cent if his eyesight limitation is 50 per cent.

Defective vision must result in an economic loss. From the safety standpoint, it likewise cannot improve a person's safety to suffer from defective eyesight. There are moments when, for our own safety, correct and instant vision is the all-important factor—it may be only for a moment, but if that moment means that we see clearly, judge distances accurately, it may result in the escape from a serious or fatal accident.

Color blindness is quite a common condition—the person who cannot discern instantly the red danger signal may walk right into the jaws of death, either on the highway or in the plant. The remedy for the losses, ills and dangers of defective vision among industrial workers is an eyesight survey of all workers in the plant, just as progressive concerns are now conducting physical examinations to determine the physical condition of persons working in their establishment and through this, to learn their physical defects and assign them to the tasks to which they are best suited both from an efficiency and a safety standpoint.

While a person with defective vision may be blamed unfairly and unjustly impaired eyesight is not to be compared with carelessness or recklessness—these are qualities which we can control ourselves, but we cannot control the condition of our eyes. These defects can be removed or greatly lessened by correct diagnosis and proper corrective glasses. Undoubtedly, accidents continually happen through defective vision but how often are they charged up to this fault? A man, for instance, may stumble and meet with an accident. More likely than not the cause of this accident will be charged to carelessness. On the other hand, suppose this man has defective vision, and while he may look out for dangers, the condition of his eyesight did not permit him to see that which he stumbled upon.

Defective vision is far more likely to prove the reason for accidents and losses than any other cause, and an eyesight survey is the means of removing this condition among industrial workers.

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## Cutting Prices--A Soliloquy

(*With Apologies to Hamlet*)

To cut or not to cut. That is the question.
Whether it is not better in the end
To let the chap who knows not the worth
Have the business at cut-throat prices, or
To take up arms against his competition.
And by opposing cut for cut, end it.
To cut—and by cutting put the other cutter
Out of business—'tis a consummation
Devoutly to be wished. To cut—to slash,
Perchance myself to get it in the neck—
Aye—there's the rub; for when one starts to meet
The other fellow's prices, 'tis like as not
He's up against it good and hard.
To cut and to slash is not to end the confusion
And the many evils the trade is pestered with.
Nay, nay, Pauline, 'tis but the forerunner
Of debt and mortgage such a course portends.
'Tis well to get the prices the goods are worth,
And not to be bluffed into selling them for what
So-and-so will sell his for.
Price-cutting doth appear unseemly.
So-and-so will sell his goods for
What his goods are worth, and who, ere long,
By stress of making vain comparison
'Twixt bank account and liabilities,
Will make his exit from the business. —*Anonymous.*

—*The Fertilizer Review, May, 1930*

# The Crushed Stone Journal

Official Monthly Publication of the
NATIONAL CRUSHED STONE ASSOCIATION, INC.
Merchandise Building 1735 Fourteenth St., N. W.
WASHINGTON, D. C.

J. R. BOYD, Editor



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## Manufacturers' Exposition Adds Much to Convention's Interest

OF late there seems to have developed no little discussion regarding the merits of holding expositions of machinery and equipment in conjunction with annual conventions, it being contended that such expositions constitute an undesirable distraction from the serious convention work; that the cost far exceeds the return to exhibitors as evidenced by sales directly traceable to expositions; and that the number of expositions held has become a distinct burden to the manufacturers.

We believe that the no doubt sincere and certainly ardent exponents of dispensing with expositions are seriously mistaken with regard to the true sentiment of both exhibitors and convention delegates. We also believe that apparently they have largely missed the fundamental purpose for which convention expositions are held.

If properly coordinated with other convention activities there is no need of the exposition's proving a distracting influence and certainly there would seem little justification for attributing to it any of the characteristics of a three-ring circus. The exposition is not intended to be humorous; it falls far short of its goal if it is only entertaining; its primary function and the justification for its continuance should be measured essentially by its educational value. It is inevitable that occasionally expositions will be held which result in dismal failure and we venture the suggestion that more often than not such failures could be directly traced to a lack of coordination between the exposition management and that of the Association, and a failure to convey to the exhibitors and delegates a complete understanding as to the purpose and intent of the exposition.

To us it seems most unreasonable to condemn expositions in general because of a few isolated instances where they did not come up to expectations.

The Manufacturers' Division Exposition of Quarry Equipment and Machinery held in conjunction with the annual conventions of the National Crushed Stone Association has established itself as one of the most important and desirable features of these meetings. The Exposition was first held in conjunction with the Seventh Annual Convention in St. Louis in 1924. Each succeeding year has witnessed an increase in its popularity as evidenced by the large gain in number of exhibitors and by the stimulating effect upon the attendance at the conventions, and we are confidently expecting all records to be broken by the Exposition which will be held in conjunction with our Fourteenth Annual Convention at the Jefferson Hotel, St. Louis, January 19-22, 1931.

Concluding, we feel that the Manufacturers' Exposition is an established feature of our annual convention; that it fulfills a definite and positive educational need in bringing to the attention of our industry under the most favorable circumstances the recent developments and improvements in the machinery and equipment used throughout the industry; and that we enjoy, and hope to continue to do so, the sympathetic and helpful cooperation of our Manufacturers' Division to the end that each successive exposition may more completely and effectively portray the changes taking place than have its predecessors.

## The "Interpretation Committee"

IN this issue of the *Journal* there is an article by Otho M. Graves, chairman of the Interpretation Committee for Trade Practice Rules in which is described the machinery set up by the Association for assisting the industry to conduct its business affairs in accordance with the trade practice rules adopted by the industry at its Trade Practice Conference held last January, the rules being finally approved by the Federal Trade Commission during April last.

With this step there come to fruition the efforts of the more serious minded and foremost thinkers of the industry to establish the means to place on a solid and wholesome plane the business conduct of the crushed stone industry, the need for which has long been recognized. What measure of success will attend this effort on the part of the industry to improve its method of doing business? That will depend almost entirely upon the degree of cooperation which is extended by the industry itself.

From the beginning, this movement has received whole-hearted and sympathetic support; a surprising unanimity of opinion was in evidence when the rules of conduct were prepared by our Trade Practice Committee and submitted to the Board of Directors for approval; and finally, at the time of the Trade Practice Conference last January, the rules were accepted with but slight change or modification. It would therefore seem to follow as a matter of course that it is the earnest and sincere intention of the industry to conduct its affairs in compliance with these rules.

It was no mere happy choice of words which lead to designating this committee as the "Interpretation Committee," but only after careful and deliberate consideration was that name decided upon. Such titles as "Enforcement Committee" and "Policing Committee" were deliberately avoided as the duties implied by such names are not properly functions of this committee.

It is our earnest belief that in by far the larger number of instances, violations of the Trade Practice Rules are not wilful, but are due more to a lack of understanding as to a proper interpretation of the rules. The Interpretation Committee is therefore in the nature of an advisor, a counsellor, a neutral, unbiased body to assist in the proper interpretation and application of the rules of conduct for the industry. The Committee will not investigate on its own initiative. It will, however, be ever ready to give counsel and advice upon request. The obligation which rests upon each and every member of the industry is to promptly appeal to the Interpretation Committee whenever it appears that the Trade Practice Rules are not being complied with.

To many, upon first consideration, to report such action to the Interpretation Committee may seem to constitute an impropriety; no one wishes to play the role of tale-bearer. To us it seems that failure to so report constitutes a far graver offense against both ourselves and the industry of which we are a part. When instances of violation of these rules of sufficient seriousness to warrant action come under your observation, let no one hesitate to promptly bring such cases to the attention of the Interpretation Committee, for only through such a course of action can we rid the crushed stone industry of the unethical and uneconomic practices with which it is at present burdened.

---

## The First Six Months

SOME interesting figures regarding business conditions for the first six months of the year as related to the crushed stone industry are given by Julias H. Barnes, Chairman, National Business Survey Conference, in the pamphlet, "The Business Situation, June 28, 1930."

"Concrete road yardage" states Mr. Barnes, "continues to exceed by a substantial margin road awards in any previous year, being 27 per cent greater than 1929 and 21 per cent greater than 1928. Street and alley yardage still falls short of previous records in nearby years.

"Shipments of cement in May increased 30 per cent over April and 3 per cent above May, 1929. Production exceeded shipments only slightly.

"Shipments of crushed stone, sand and gravel are running 5 to 10 per cent below the same period of last year. The demand for road construction purposes is about the same as last year, but railroad ballast orders have been considerably curtailed."

# NOW–

## Punched Manganese Plate!

PRODUCERS of aggregate are familiar with the long service and outstanding economy of manganese steel screen cloth.

Now, for the first time, punched manganese plate is also available for screening operations; in thicknesses from ½" down to 16 gauge, and in any size and pitch of perforation.

This improved screen plate is made from TISCO TIMANG, the 14% manganese steel which cold works readily, yet possesses the same wear-resistance as the cast manganese steel so extensively used for the wearing parts of your heavy duty equipment.

It will pay you to try this improved TIMANG punched manganese plate for your next requirement. In every installation to date, it has appreciably lowered screening costs by far outlasting ordinary plate.

TISCO TIMANG SCREEN CLOTH

TIMANG Manganese Steel Screen Cloth is available in any mesh or clear opening and any wire size from .148" dia. to 1" dia. For special purposes TIMANG wire as small as .003" dia. can be furnished.

TW

**TAYLOR-WHARTON IRON AND STEEL CO.**

HIGH BRIDGE, NEW JERSEY

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### Keeping Ahead of the Times in Paving Practice

(*Continued from page* 8.)

worked out by the engineers and has proved unusually efficient and a time and labor saver. The deformed plate is placed upon two pieces of planking. The space between the planks, and extending up into the deformation, is filled by a specially cut block to give stiffness. The top of the plate is then painted with hot asphalt and the expansion material is laid on top of the plate. Two strips of planking are then placed on the edges of the filler material and an Austin Pup roller is run over the planks. The roller forces the filler into conformity with the deformation and presses the filler upon the metal plate. Usage has proved that aherence between plate and filler is very tenacious.

This method was first used in 1927. At first costs were about five cents per linear foot, but as the trick was learned and workmen became proficient this cost was reduced considerably. With this type of joint there has been no cracking along joints, and not one of the joints has lifted. More than 100,000 sq. yds. of pavement have been laid with this joint with excellent results.

### Work Carefully Inspected

The concrete is kept under constant surveillance at the job. The amount of water is watched and five gallons of water per sack of cement is specified. This does not include the moisture in the aggregate, but this has been found to be both low and consistent. Slump tests are made right along, and the engineers have developed mixing so that slumps of from one to one and one-half inches are consistently maintained. This slump, with the kind of fine aggregate used, results in a somewhat harsh mix, but finishing operations used overcome this difficulty.

After the concrete is screeded to shape a hand roller is run over the surface. With the amount of water and fine aggregates used very little water comes to the surface and laitance is unknown. The rolling is followed by two beltings. The first belting is run transversely of the pavement in the usual manner. Unlike ordinary practice, however, the final belting is done longitudinally. Two bridges are used and the belt is a strip of burlap. This belt is run back and forth with the movements overlapping to eliminate ridges. The engineers have found that these finishing operations have resulted in remarkably smooth pavements, devoid of ridges or unequalities.

The work of the engineering department is under the jurisdiction of the city engineer, Robert L. Fox.

# THIS CUSTOMER BOUGHT ONE LINN...

*This shows the first unit of the Linn fleet at work for the United Verde Copper Company, Jerome, Arizona. W. V. DeCamp is general manager*

*The Linn tractor it ideally suited for difficul quarry operations because of its great power, flexible traction, and all 'rouud sturdy construction*

## THEN...

# PERFORMANCE SOLD THEM FIVE MORE

**Do Linn tractor purchasers repeat? They do—most decidedly. Take the case of the United Verde Copper Company, Jerome, Arizona. In September, 1928, this company purchased one Linn tractor—to try it out. It gave such satisfaction that in December, 1928, they bought two more Linn tractors. That isn't all. Since that time they have added three Linns to their fleet! Linn performance, under the severest of conditions—down in the jagged pits of an Arizona copper mine—sold five more Linns.**

**That is only one example. There are many, many more. On all heavy hauling jobs—and in quarry work—the Linn Tractor has won repeat orders on the basis of satisfactory performance and low hauling costs. Giant power, sturdy construction, flexible traction, ability to carry its own pay-load, easy truck-like steering and operation—these are vital features which stamp the Linn as the outstanding heavy-hauling tractor of the age.**

**Send for complete information about the Linn Tractor, Linn performance pictures, etc. Learn about Linn service which is permanently available through the La France-Republic-Linn world-wide organization of factory branches and distributors—one of which is near you. Write or wire.**

Patent No. 1,270,531
" " 1,521,454
" " 1,685,641
" " 1,685,676
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Other Patents Pending.

# LINN MANUFACTURING CORPORATION

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*Manufacturers of* American La France Trucks, Linn Tractors, Republic Trucks

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## HEAVY-DUTY QUARRY SHOVEL

**THEW SHOVEL COMPANY • Lorain, Ohio**

**¾ to 1¼ and 1½ yd. Shovels, Clamshells, Draglines**

**Electric, Gas, Diesel Powered**

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FLEXCO
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These well known fasteners stop trouble with elevator and tight butt conveyor joints. They have far more strength than needed and the pull is equalized on both sides of the belt insuring long service. Note recessed plates which embed in and compress the belt instead of pulling against the bolt holes. Stocked by leading jobbers in 5 sizes. Consultation invited.
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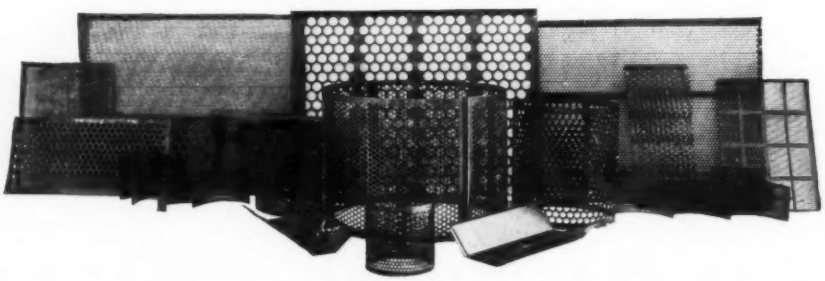
# PERFORATED METAL SCREENS

*The quality of CROSS Screens gives longer service, increased production and lower cost.*

CATALOG ON REQUEST.

*BUCKETS, TROUGH, FLIGHTS, CHUTES, ETC.*



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# A complete job by

# BLAW-KNOX

READY MIXED CONCRETE PLANTS

*Agitator* TRUCK BODIES

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The efficient plant of the Scranton Ready Mixed Concrete Co., Scranton, Pa., is an illustration of Blaw-Knox ability to design and furnish complete equipment for the PRODUCTION and HAULING of Ready Mixed Concrete.

—the moisture-proof Cement Bin

—the conveyor arrangements

—the 51-ton self-cleaning Batcherplant with a double Weighing Batcher for the sand and stone and a separate Weighing Batcher for the cement

—and three Blaw-Knox AGITATOR Truck Bodies which haul the mixed concrete and prevent segregation of the aggregates

the entire plant layout is a product of Blaw-Knox engineering experience and skill.

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I am interested in the production and hauling of Ready Mixed Concrete

Send me complete information about ☐ Blaw-Knox Ready Mixed Concrete Plants ☐ Blaw-Knox AGITATOR Truck Bodies

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# Use the Weston Testing Screen

Control your crushing and screening operations—

*More Quickly*
*More Easily*
*More Accurately*

Send for bulletin describing this screen. Ideally suited for testing coarse materials, from about ¼-inch up.

## HENDRICK MFG. CO.

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*Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site Treads, Mitco Armorgrids and Elevator Buckets of all types*


### Penetration Macadam, Design and Construction

(*Continued from page* 11.)

The quality of this choke or key-stone shall be the same as that required for top stone. The size of it, however, varies with the type of final surface desired by the engineer.

Should he desire an open grained surface showing relatively large gaps between the individual pieces of top stone he should use small key-stone, say ½-in. stone. On the other hand should he want close grained, tight surface he should use a larger key-stone, say ¾-in. stone. This seeming paradox is explained by realizing that the larger sized key-stone fits individually into the various voids whereas the smaller stone is in small pockets and not being glued together with binder is wheeled out by traffic leaving open voids.

### The Seal Coat

The application of the seal coat has fewer troubles than any other operation. Of course the penetration course must be rolled and rolled and then rolled some more. The excess choke stone must be swept off. Debris, such as leaves, twigs, papers, etc., must be cleaned off. From ½ to ¾ gal. per square yard of bituminous binder is applied and covered immediately with a fairly heavy though even layer of ½-in. cover stone. The real job, after the application of the seal coat, is rolling. Even after the road is thrown open to traffic, rolling should be continued. The binder we find takes from two to ten days to lose its plasticity and during that period every effort should be made to gain "compactness."

Acknowledgment.—The foregoing is a paper presented at the 1930 convention of the Association of State Highway Officials of the North Atlantic States.


*LONGER LASTING SCREENING*

## ROK-TEX

Woven for dependable service, every part that goes into the manufacture of "Buffalo" Wire ROK-TEX is planned to withstand all the hard knocks connected with stone screening. *Actual working tests have proved ROK-TEX has from 50% to 200% longer life than ordinary wire screening.*

Write for quotations, samples and full information

BUFFALO WIRE WORKS CO.
INCORPORATED
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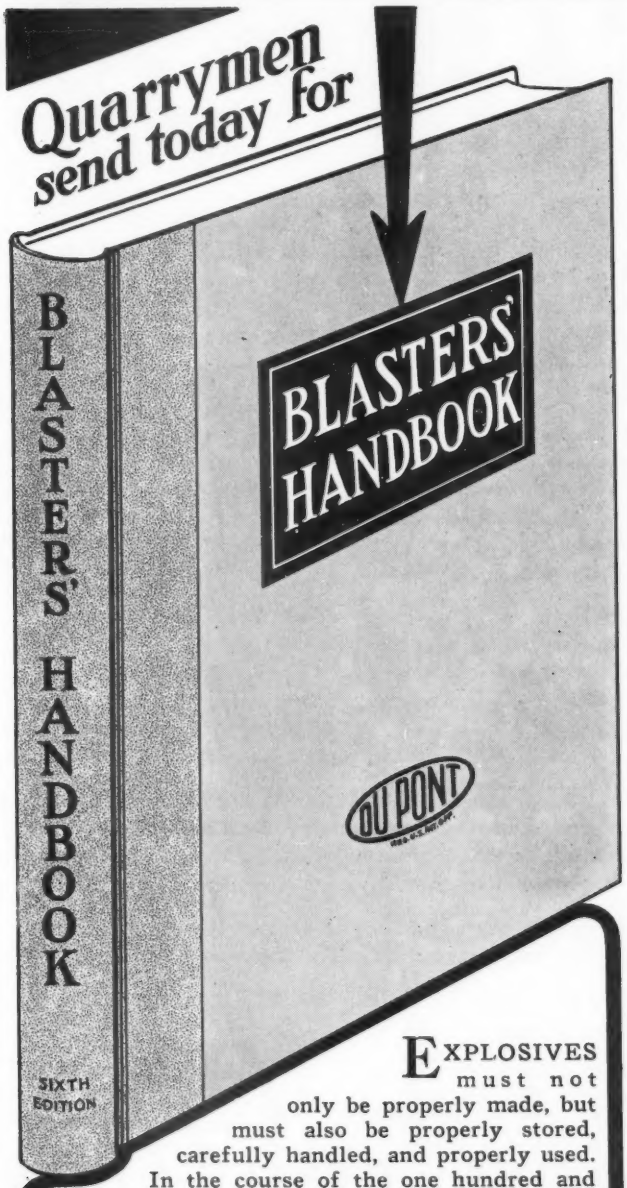
585 Terrace Buffalo, N. Y.

Quarrymen send today for




EXPLOSIVES must not only be properly made, but must also be properly stored, carefully handled, and properly used.

In the course of the one hundred and twenty-eight years that the du Pont Company has been engaged in the manufacture of explosives, it has gained a wide knowledge of the storage, handling and use of explosives and it makes a practice of sharing this knowledge freely with its customers.

To this end, we offer the new Blaster's Handbook, containing the latest data on explosives.

**E. I. DU PONT DE NEMOURS & COMPANY, Inc.**

*Explosives Department, Wilmington, Delaware*

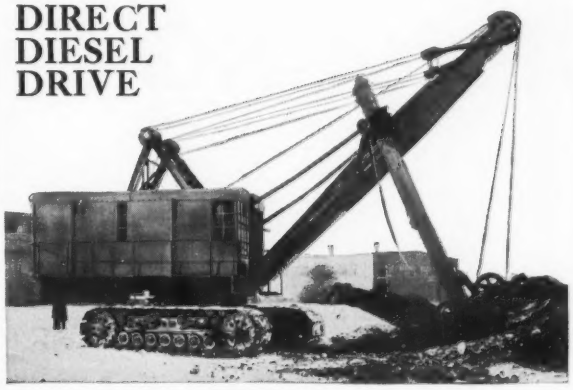


# Types

**800** (2½ - 3 CU. YDS.) *and* **900** (3½ - 4 CU. YDS.)

*with*

**DIRECT DIESEL DRIVE**



Direct Diesel drive has made a distinct impression upon engineers and others responsible for loading costs.

Power is applied *directly* to the hoisting, traveling, crowding, and swinging mechanisms. No complicated electrical generators and motors are interposed between the engine and the parts that do the work. This direct, simplified drive insures maximum delivery of power to the digging end.

There are many other advantages of Diesel drives. Only a small volume of low-cost fuel is required. The engine torque actually increases when the machine is slowed down below 50% of normal speed in heavy digging. Combined, these things insure low-cost yardage.

A new conception of shovel economy awaits you. Ask for Bulletin describing P & H Types 800 and 900 Diesel Shovels fully.

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**P&H Diesel EXCAVATORS**

# TECHNICAL SERVICE IN QUARRY BLASTING

Quarry Blasting has developed into a science that has attracted the Engineer. Full and complete knowledge of industrial explosives, blasting supplies, rock formations, and of quarry operations are factors which require technically trained men as advisers on how crushed stone can be produced most economically.

To a great extent the cost of stone ready for the crusher is governed by the kind and location of drill holes and the judgment exercised in the choosing and applying explosives. This can be mastered by the layman, but the ever increasing list of explosives and their specific properties as well as the unusual conditions of formation of rock, which are constantly encountered, present problems that require the service of the Engineer.

To aid quarrymen to obtain best results in blasting, the Atlas Powder Company has been as energetic in training men to serve as Engineers or Technicians in the use of explosives as it has been in research work to devise new explosives and blasting supplies. The quality of the products of the Atlas Powder Company has always been unexcelled and the technical service that this company can offer takes equal rank with it.

You may depend upon the statements to describe our products and the recommendations to improve blasting as made by Atlas Technical Representatives as being reliable and conservative.

This service is freely offered and can be secured by requests made to either Branch Offices or to the General Office of this company.

"A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT"

# ATLAS POWDER COMPANY

**Wilmington, Delaware**

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# ROL-MAN for Low-Cost Operation

The two Robins Gyrex screens pictured above are installed in an Eastern crushed stone plant, and handle all the output of the grizzly and primary crusher. With such a volume of abrasive material going over them, it is essential from the standpoint of economical operation, that replacements of screen cloth be kept at a minimum. That is why they are equipped with ROL-MAN Double-Lock Mesh-Woven Manganese-Steel Screens. The wear-resisting qualities of true manganese steel make these screens an investment that pays dividends in actual dollars-and-cents savings. It has 2½ times the toughness and strength of ordinary wire and 8 to 10 times the resistance to wear. In addition, accurate sizing of the product is insured throughout the life of the screen cloth. Bulletin No. 120 contains 48 pages of valuable data on the application and operation of vibrating, revolving and inclined-gravity screens for sand and gravel, crushed stone, slag, ore, coke and other abrasive materials. Write for Copy.

**The Robins Conveying Belt Co. and other manufacturers of screening equipment will supply ROL-MAN. if specified, on new machines, or will supply it for replacements on existing machines. Ask for ROL-MAN by name to be sure of obtaining the high efficiency and long life for which these true manganese-steel screens are noted. There will be no delay—shipments are made promptly.**

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A TRUE MANGANESE STEEL

**MANGANESE STEEL FORGE COMPANY**
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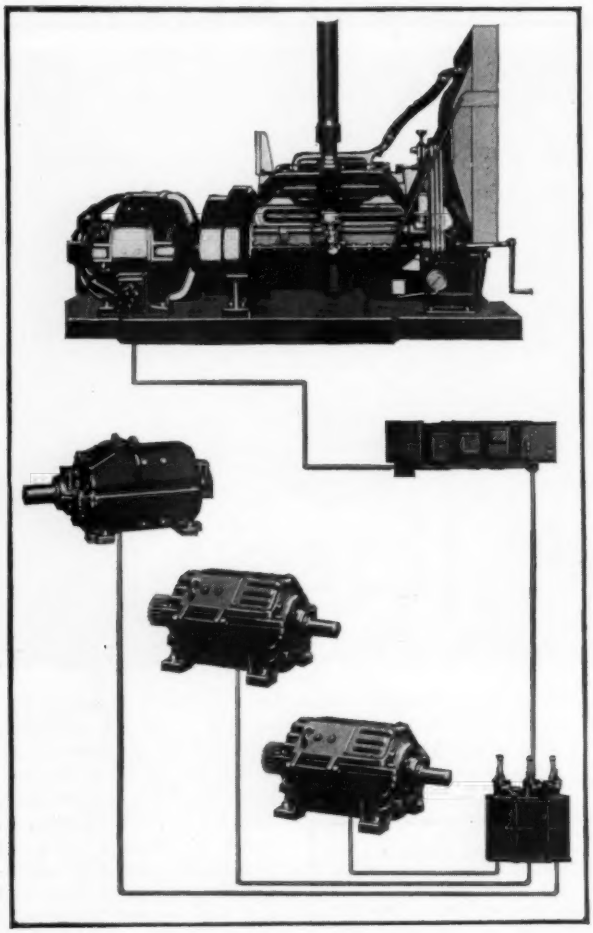
# CUSHIONING

## *The* DIGGING SHOCKS



Marion Gas-Electric system of power application —gasoline for economy—electricity for flexible power—independent three-motor drive —no mechanical transmission

**DIGGING shocks cause most excavator breakdowns. These shocks cannot be eliminated, but by proper design can be cushioned and controlled.**

**With Marion's system of power application shocks, vibrations and sudden overloads at the dipper are absorbed and levelled off before reaching the engine.**

**In the Marion Gas-Electric, for the first time, the pliancy of steam is combined with the economy and convenience of gasoline.**

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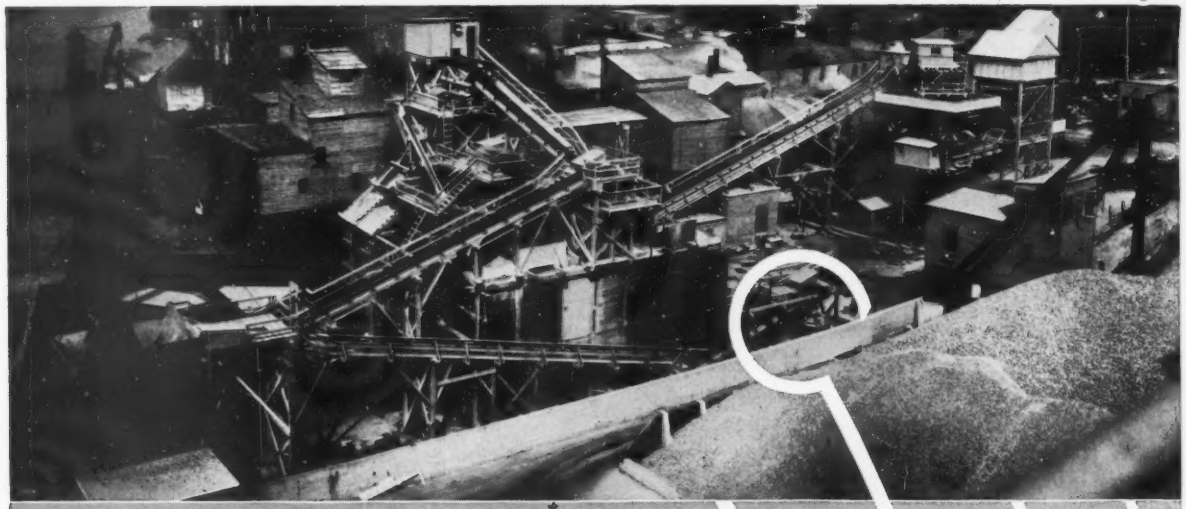
***Shovels, Draglines, Cranes, 1 yd. to 20 yds.***

**MARION, OHIO, U.S.A.**

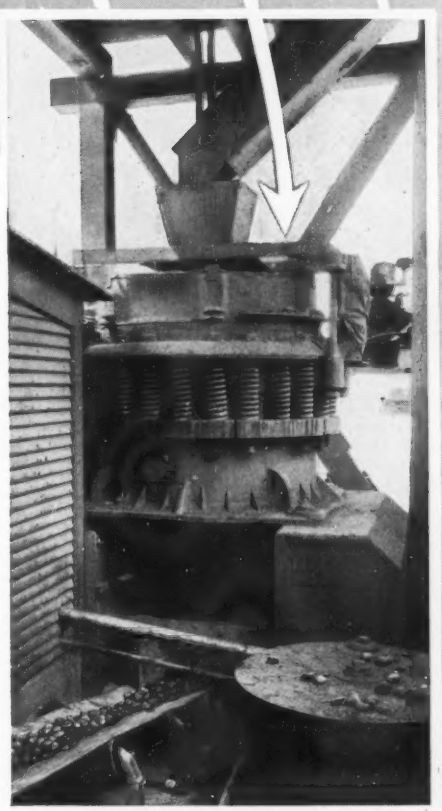
***Representatives in the Principal Cities of the World***



# Look for Them in the Newer Crushing Plants

In newly built, or recently modernized plants that are producing finely crushed materials in quantity, almost without exception a Symons Cone Crusher will be found installed. If there is a new plant in your vicinity, see what reduction crusher is being used.

There are many reasons for the rapid growth of this unusual crusher. An investigation of its performance in the crushing of stone, gravel, slag and a large variety of ores will easily prove why it is being chosen by those familiar with the latest improvements in crushing equipment.



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Washington, D. C.
Three-Foot Crusher

## NORDBERG MFG. CO.

MILWAUKEE, WIS.

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# SYMONS CONE CRUSHER

*The Fourteenth Annual Convention*

*OF THE*

**National Crushed Stone Association**

*WILL BE HELD IN*

*St. Louis*

*Missouri*

*January 19, 20, 21, 22, 1931*

# St. Louis in 1931

¶ In conjunction therewith the Manufacturers' Division will hold its annual Exposition of Quarry Equipment and Machinery which has come to be recognized as one of the outstanding events of the meeting.

¶ Make your plans now to attend this annual foregathering of the crushed stone industry.

¶ All crushed stone producers of the United States and Canada, regardless of whether or not they are members of this Association, are most cordially invited to be present at St. Louis and share with us the many pleasures and benefits of the Convention.

FOR FURTHER INFORMATION ADDRESS

**THE NATIONAL CRUSHED STONE ASSOCIATION**

1735 Fourteenth Street, N.W.

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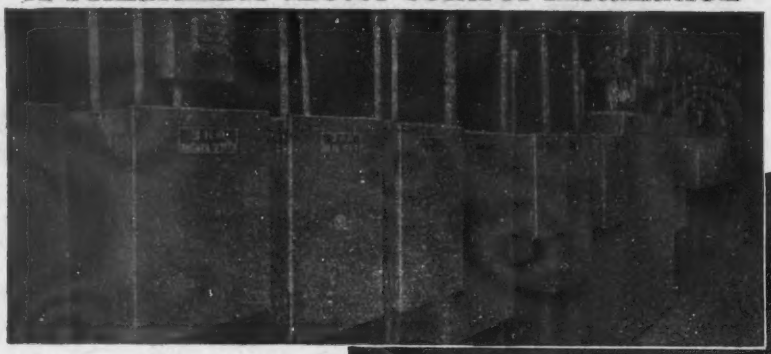
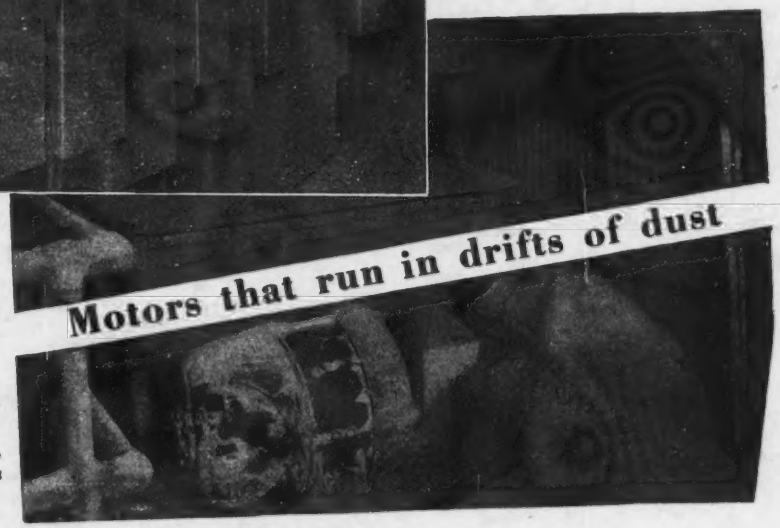
# At the G-E Motorized Plant of the France Slag Company

## A remarkable motor-control installation



*Control room, France Slag Company, Toledo, Ohio*



## Motors that run in drifts of dust

*One of the G-E totally enclosed, fan-cooled motors driving a magnet belt*

**ALL the control compactly arranged in one room. The entire flow sheet started and stopped in sequence at the touch of one button on the ground floor. Safety provided by emergency stop-buttons located on every floor. All the motors totally enclosed, fan-cooled—operating reliably day after day in drifts and clouds of abrasive dust.**

**This is the type of electrification the rock-products plant can obtain when G-E Motorized Power is selected. To specify G-E Motorized Power is to obtain: (1) the correct motor for each machine and each service condition; (2) the correct control for each motor; (3) the coördination of motors, controller, and machinery to achieve maximum production at the lowest operating cost. Information and service are always available at a nearby G-E office.**

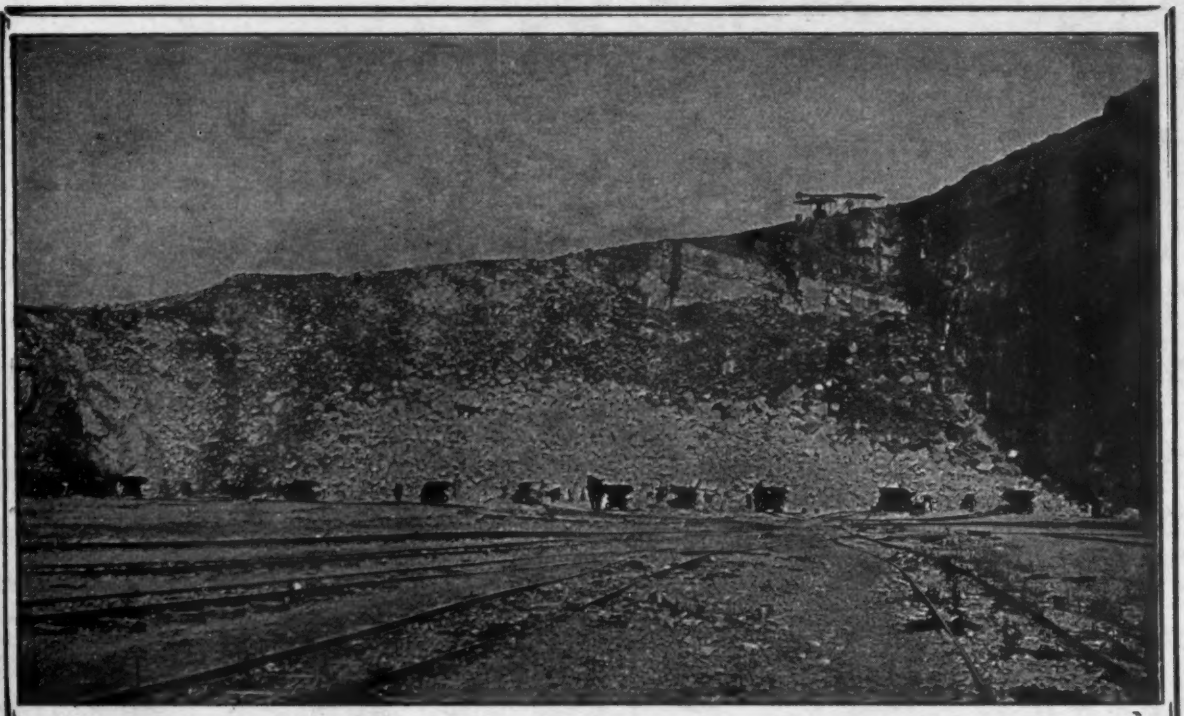
*Motorized Power*
*—fitted to every need*

200-378

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

# GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES



## CORDEAU Helps Improve the Fragmentation

**CORDEAU, by speeding up the rate of detonation of the explosive charges in a blast, adds materially to the shattering effect of the explosive no matter whether it is a high grade dynamite or the slower blasting powders. Rock well broken, toe kicked out, little secondary blasting, and crushing units well supplied with rock mean good operating conditions and consequent profit for the quarry operator.**

**CORDEAU**
**DETONATING FUSE**
**BICKFORD**

# THE ENSIGN-BICKFORD CO.

**SIMSBURY - CONNECTICUT**